REMARKS

I.   Introduction

In response to the Office Action dated August 12, 2009, claims 39, 41-44, 47, 49-73 and 75-80 have been cancelled, claims 1, 37, 38 and 123 have been amended, and 124-127 have been added. Claims 1, 3-9, 11, 13-38 and 123-127 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II.   Claim Amendments

Applicants' attorney has made amendments to the claims as indicated above in order to focus their scope on methods that use a computer processor to generate filter coefficients to configure a filter. These amendments are fully supported by the specification as filed (see, e.g. pages 8 and 9 and FIG. 21) and introduce no new matter.

Claims 1, 37 and 38 are respectively drawn to a method, apparatus and program memory arranged to configure a filter by generating filter coefficients, generation of filter coefficients being carried out using the method of solving linear equations described in the application. Claim 123 is a method claim based upon claim 1, but with a further limitation as to how the estimate of the solution of the system of linear equations is updated, using two predetermined conditions. Claim 124 is similar to claim 37, with additional limitations relating to the structure of the apparatus. In claim 126, the methods are further limited to the practical/physical application of an echo cancellation apparatus.

III.   Office Action Subject Matter Rejection

In paragraphs (4)-(5) of the Office Action, claims 1, 3-9, 11, 13-39, 41-44, 47, 49-73, 75-80, and 123 were rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

In response, Applicants have amended all independent claims in accordance with the Examiner's suggestion so that they recite both: (1) a practical/physical application as a tangible result (e.g. configuring said filter using the filter coefficients generated by the method, said filter being arranged to process a received signal to generate a filtered signal based upon said filter coefficients); and (2) specific hardware components for carrying out the claimed invention (i.e. a processor). Moreover, independent claim 123 further recites the practical/physical application of requiring the

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filter coefficients to be used as part of an <u>echo cancellation apparatus</u>. Similarly, independent claim 124 further recites an apparatus for filtering a signal, an apparatus that includes <u>a filter and a filter coefficient setting circuit</u>. In addition, independent claim 126 further recites an echo cancellation apparatus, an apparatus including <u>a loud speaker, a microphone, a filter and a filter coefficient setting circuit</u>. Because all independent claims recite, **at the very least**, the use of a computer processor hardware component in a system designed to use linear equations to configure a filter (e.g. to generate a filtered signal based upon filter coefficients generated by the system of linear equations), these claims unambiguously recite statutory subject matter.

IV.   <u>Prior Art Rejections</u>

In paragraphs (6)-(7) of the Office Action, claims 1, 3-9, 11, 13-25, 30-39, 41-44, 47, 49-61, 66-73, 75-80, and 123 were rejected under 35 U.S.C. §102(b) as being anticipated by Simon, "An Overlaying Technique for Solving Linear Equations in Real-Time Computing," (Simon). In paragraphs (8)-(9) of the Office Action, claims 27-29 and 63-65 were rejected under 35 U.S.C. §103(a) as being unpatentable over Simon. Applicants respectfully traverse these rejections for the reasons noted below.

A.   APPLICANTS' RESPONSE TO REJECTIONS UNDER 35 U.S.C. §102(b)

The claims as amended hereinabove are directed to methods and computer elements and apparatuses for generating filter coefficients to configure a filter. All independent claims now recite a combination of the steps including the steps of storing an estimate value for each of a number of unknown variables and then establishing a respective auxiliary value **<u>for each</u>** of these estimate values. The auxiliary values are then used to determine whether a respective predetermined condition is satisfied for each estimate value. The predetermined condition involves the respective auxiliary value and the estimate value is updated if and only if the respective predetermined condition is satisfied. In these claims, the updating comprises adding a predetermined scalar value d to the estimate value or subtracting a predetermined scalar value d from the estimate value. The claims further require that these determining and updating steps are then repeated a plurality of times.

In the outstanding rejection, the Examiner asserts that Simon teaches Applicants claimed estimate value element in "X_{intial} in Figure 1 and 'Acceleration of the Computational Procedures' section at page 516" (Office Action at page 4). The Examiner then asserts that Simon that further teaches Applicants claims element of establishing auxiliary values for each estimate value (and then determining if a predetermined condition involving the respective auxiliary values are satisfied) at "paragraph right under expression 9 in page 515 and 'Finding a Solution for a Set of Linear Equations' section in page 515", at "Figure 1 and 'Preparing for the Next cycle' section in page 516" (Office Action at Page 4). As discussed in detail below, Applicants respectfully traverse these outstanding rejections because one of skill in the art would not agree with the Examiner's analysis of the Simon disclosure, for example the assertion that Simon teaches an element which corresponds to the auxiliary value as it is recited in the pending claims.

To make the outstanding rejections, the Examiner relies on distinct sections of Simon, namely Figure 1 at page 513 as well as text at page 515 and page 516. The following analysis of these sections in Simon shows why the skilled artisan would not agree with the Examiner's analysis of the Simon disclosure. First, while Simon does teach delta testing in Figure 1, this testing designed to determine whether the difference between two vectors is small enough. In this context, Simon teaches that, if the difference between the two vectors is not small enough then a new vector of estimate values is determined. That is, Simon teaches <u>a single test based upon all of the estimate values is carried out</u> and if the delta testing is satisfied, all of the values in the vector x_{next} are updated. In this testing scheme in Figure 1, **all** of the values in x_{next} are updated **or none** of the values in x_{next} are updated.

The above-noted testing scheme in Simon is quite different from the invention recited in the claims. For example, the methods recited in the claims as amended hereinabove require each estimate value to be <u>individually tested</u> against a predetermined condition involving a respective auxiliary value and the <u>individual estimate value to be updated if and only if</u> the particular estimate value satisfies the condition involving the estimate value's respective auxiliary value. In this way, each of the estimate values in Applicants' claimed methods are individually refined, independent of the rest of the estimate values, and independent of whether or not the other estimate values satisfy the predetermined condition involving their respective auxiliary values. In contrast, the Simon disclosure teaches methods designed so that <u>all</u> of the values in x_{next} are updated <u>or none</u> of the

values in x_{next} are updated. Consequently, Simon does not teach or suggest methods where each of a number of estimate values <u>are **individually refined, independent**</u> <u>of the rest of the estimate values</u>. For this reason, Simon cannot teach or suggest this element, much less this element within the specific constellation of elements that are recited in Applicants' claims.

In addition, the claims further specify that each estimate value is updated by adding or subtracting a scalar value d. The Examiner asserts that this element is disclosed by expressions 17-22 in page 515. One of skill in this art would also not agree with this characterization of Simon and would instead note that Simon's "Finding a Solution for a Set of Linear Equations" in which expressions 17-22 are located indicates that the next value x_{next} can be obtained from the previous one x_{last} by adding to x_{last} a vector h, where h is the solution of equation (10). In this context, the addition of a vector to a vector of estimate values does not teach or suggest, on a per estimate value basis, adding a predetermined scalar value d to an estimate value. Instead, the vector h will typically contain a plurality of different values. Consequently, adding the vector h to x_{last} will therefore typically add a different value to each of the values in x_{last}. This is clearly different from what is recited in Applicants' claims, for example adding a predetermined scalar value d to an estimate value if and only a predetermined condition is satisfied (e.g. as recited in claim 1). In this context, in any given cycle of the steps recited in the claims (e.g. steps (e) and (f) in claim 1), estimate values such as, for example, three estimate values may be updated out of ten estimate values, and each of the estimate values will be updated with respect to the same scalar value d. In contrast, adding a vector h to a vector as described in Simon not only necessarily updates each of the values in x_{last}, if any updating is to be carried out, additionally adding a vector h will in general add a different value to each of the values in x_{last}. For this reason, Simon fails to teach or suggest Applicants' methods, ones that require each estimate value to be <u>individually tested</u> against a predetermined condition involving a respective auxiliary value and the <u>individual estimate value then updated by adding or subtracting a</u> <u>scalar value d</u> if and only if the particular estimate value satisfies the condition involving the estimate value's respective auxiliary value.

Anticipation under 35 U.S.C. § 102 has strict requirements. All elements of a claim must be found in a single reference in order to support an anticipation rejection (see e.g. M.P.E.P. 2131). Specifically, a finding of anticipation requires that "each element of the claim at issue is found, either

expressly described or under the principles of inherency, in a single prior art reference or that the claimed invention was previously known or embodied in a single prior art device or practice." See, e.g., *MEHL/Biophile Int'l Corp. v Milgraum*, 192 F.3d 1362, 1365 (Fed. Cir. 1999). As noted above, one of skill in this art would note that Simon fails to teach or suggest methods where each of a number of estimate values are <u>individually refined in the manner recited in the claims, independent of the rest of the estimate values</u>. Because Simon fails to teach or suggest this aspect of Applicants' claims, it cannot anticipate the claimed invention. For this reason, a withdrawal of the rejection under 35 U.S.C. § 102(b) is respectfully requested.

B.   APPLICANTS' RESPONSE TO REJECTIONS UNDER 35 U.S.C. §103(a)

To render claims 27-29 unpatentable under 35 U.S.C. §103(a), Simon must teach or suggest each and every feature of these claims. See *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) ("to establish prima facie obviousness of a claimed invention, all the claim features must be taught or suggested by the prior art"). As the Board of Patent Appeal and Interferences has confirmed, a proper obviousness determination requires that an Examiner make "a searching comparison of the claimed invention – including all its limitations – with the teaching of the prior art." See *In re Wada and Murphy*, Appeal 2007-3733, citing *In re Ochiai*, 71 F.3d 1565, 1572 (Fed. Cir. 1995). Further, the necessary presence of all claim features is axiomatic, since the Supreme Court has long held that obviousness is a question of law based on underlying factual inquiries, including ascertaining the differences between the claimed invention and the prior art. *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966).

As noted above, one of skill in this art would agree that Simon fails to teach or suggest, for example, methods where each of a number of estimate values are <u>individually refined in the manner recited in the claims, independent of the rest of the estimate values</u>. Because Simon fails to teach or suggest this aspect Applicants' claims, it cannot render the claimed invention obvious. For this reason, a withdrawal of the rejection under 35 U.S.C. § 103(a) is respectfully requested.

In summary, solving a set of linear equations is a computationally expensive task. Illustrating this, the computation set out in Simon to update x_{last}, involves determining, at each iteration, a vector *h* by solving a system of linear equations $A_{new}h$. Solving a system of linear equations $A_{new}h$ to

determine the vector h is itself a computationally expensive task involving determining matrix inverses, as shown in equations (17) to (22) of Simon. In the context of these challenges in the art, Applicants have determined that filter coefficients can be generated by solving a set of linear equations by establishing a respective auxiliary value for each of a set of estimate values, and processing each of the estimate values with respect to a respective predetermined condition that involves the estimate values respective auxiliary value. A particular estimate value is updated by the computationally inexpensive operation of addition or subtraction of a predetermined scalar value if that estimate value's predetermined condition is satisfied. Applicants claimed invention, one which determines whether or not an individual estimate requires updating using a condition involving a respective auxiliary value, and updating the individual estimate if this is the case, further reduces the computational complexity of the method and allows complex calculations, involving determining matrix inverses as shown in equations (17) to (22) of Simon, **to be replaced by a series of simple scalar additions or subtractions** (as is recited in all independent claims).   As such, the independent claims provide improved methods of generating filter coefficients that are both novel and inventive.

Finally, claim 123 has been further amended to specify that there are a first and a second predetermined condition and that the predetermined conditions each involve the respective auxiliary value and scalar value d. If the first condition is satisfied then the estimate is updated by adding the scalar value d and if the second condition is satisfied then the estimate is updated by subtracting the scalar value d. There is clearly nothing in Simon to teach or suggest any of these features in claim 123, and in particular, in so far as Simon can be said to teach a predetermined condition, Simon only considers a single condition with a single updating technique in the case where the condition is satisfied. For this additional reason, the rejections to claim 123 should be withdrawn.

For the reasons noted above, independent claims 1, 37, 38, 123, 124 and 126 are allowable over the Simon disclosures. Further, the dependent claims are submitted to be allowable over Simon in the same manner, because they are dependent on independent claims 1, 37, 38, 123, 124 and 126 because they contain all the limitations of the independent claims. In addition, the dependent claims recite additional novel constellations of elements not taught or suggested by Simon.

V.   Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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